Chapter 1 -
Savannah River Subbasin 03-13-01
Includes the Tullulah and Chattooga Rivers

1.1 Water Quality Overview

Subbasin 03-13-01 at a Glance

Land and Water

Land area:	72 mi^2
Stream miles:	76.6
Lake acres:	21

Population Statistics

1990 Est. pop.:	1,640 people
Pop. density:	23 persons / mi^2

Land Cover (%)

Forest / Wetland:	96.8
Surface Water:	0.6
Urban:	0.4
Cultivated Crop:	0.1
Pasture / Managed Herbaceous:	2.1

This mountainous subbasin is divided into two pieces: a small portion of the Tullulah River headwaters in Clay County and a larger portion of the basin that includes the Chattooga River, as well as Big, Clear and Overflow Creeks. The majority of streams in this subbasin flow generally south toward Georgia; however, the Chattooga River forms part of the state boundary between Georgia and South Carolina. The Chattooga and Tullulah Rivers join to form the Tugaloo River in Georgia. A map of this subbasin including water quality sampling locations is presented as Figure B-1.

Bioclassifications for sample locations are presented in Table B-1. Use support ratings for each applicable category in this subbasin are summarized in Table B-2. Refer to Appendix III for a complete listing of monitored waters and further information about use support ratings.

Most of the land within this subbasin is forested (97 percent) and lies within the Nantahala National Forest which includes the Southern Nantahala Wilderness and the Ellicott Rock Wilderness areas. Although the Town of Highlands lies primarily in the Little Tennessee River basin, the fringes, including many new residential subdivisions, are located in this subbasin. This subbasin also contains the majority of the Cashiers community.

Water quality in this subbasin is generally excellent. Nearly all waters are classified trout waters, and the Chattooga River along with many of its tributaries including the Scotsman, Overflow and Big Creek watersheds are classified Outstanding Resource Waters. Additionally, 17 miles of the Chattooga River are a National Wild and Scenic River.

There are five permitted dischargers in this subbasin; all were in compliance with permit limits over the most recent review period. Two facilities are required to monitor the toxicity of their discharge: The Mountain (formerly known as the Highlands Camp and Conference Center) and the Cashiers WWTP. The Mountain, which discharges to Abes Creek, has experienced toxicity problems since monitoring began in 1993. Abes Creek and this facility are discussed further on page 59.

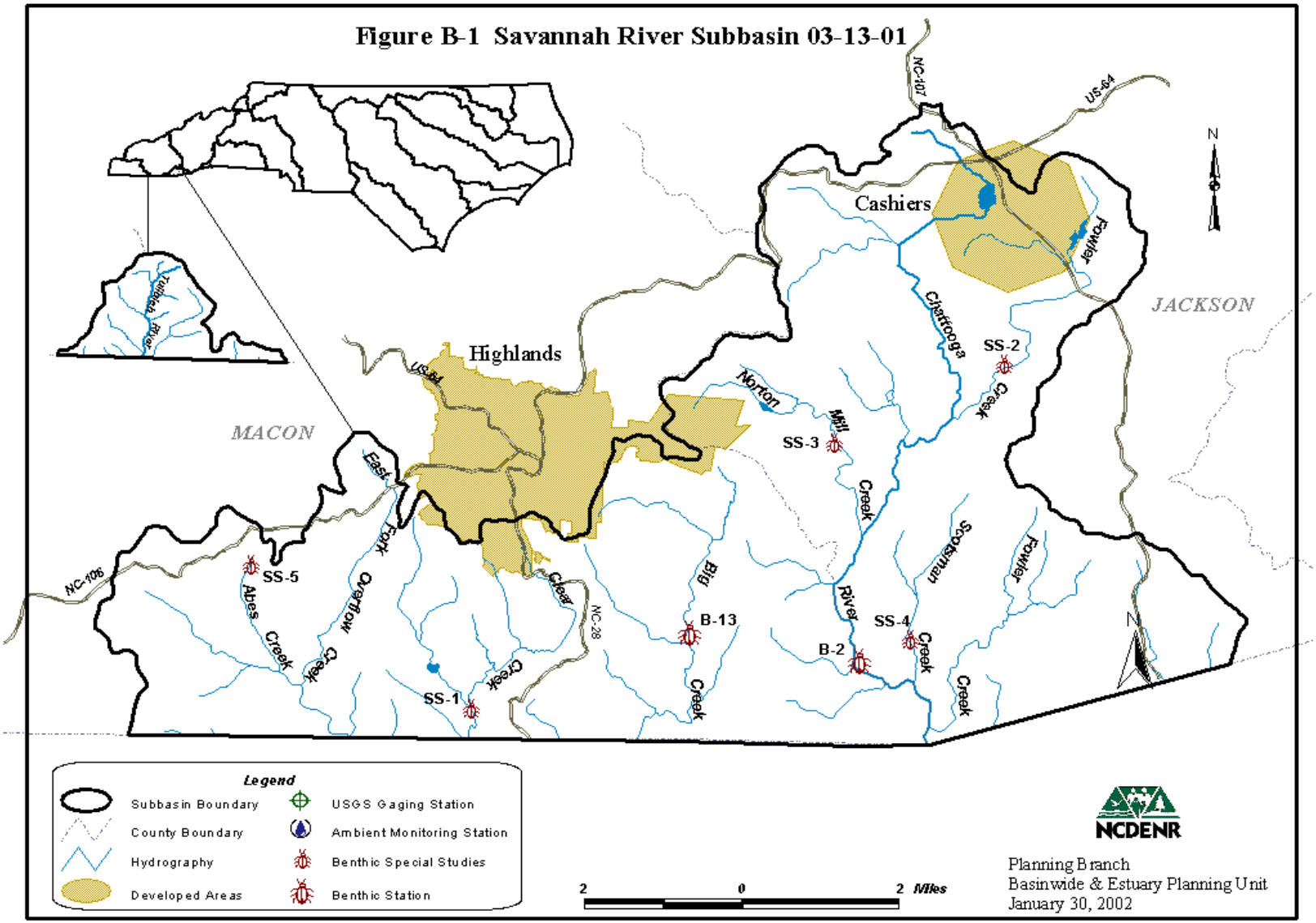

Figure B-1 Sampling Locations within Subbasin 03-13-01

Table B-1 DWQ Monitoring Locations and Benthic Macroinvertebrate Bioclassifications (1999) for Savannah River Subbasin 03-13-01

Site	Stream	County	Location	Bioclassification
Benthic Macroinvertebrates				
B-2*	Chattooga River	Jackson	SR 1100	Excellent
B-13*	Big Creek	Macon	SR 1608	Excellent
SS-1	Clear Creek	Macon	SR 1618	Excellent
SS-2*	Fowler Creek	Jackson	SR 1107	Excellent
SS-3*	Norton Mill Creek	Jackson	SR 1107	Excellent
SS-4*	Scotsman Creek	Jackson	SR 1100	Excellent
SS-5	Abes Creek	Macon	Near origin	Not Impaired

* Historical data are available; refer to Appendix II.

Excellent water quality was documented for all major streams in this subbasin in 1999. Excellent or Good water quality likely exists in many of the smaller streams as well; however, some tributaries may be impacted by construction activities and runoff from developed areas. The benthic macroinvertebrate community in the Chattooga River has been sampled five times at SR 1100 since 1988 and has always received an Excellent bioclassification. Some of the most pollution intolerant species of insects have been common or even abundant.

In November 2001, DWQ biologists within the Environmental Sciences Branch conducted a special study of the benthic macroinvertebrate community at two sites on the upper Chattooga River which are not represented on Figure B-1: 50 meters above the Cashiers WWTP discharge and 50 meters below the discharge. Results indicate that the Chattooga River above the Cashiers WWTP discharge is Not Impaired. However, the benthic macroinvertebrate community in the Chattooga River below the Cashiers WWTP is being significantly impacted. For further discussion of the upper section of the Chattooga River, refer to page 57.

Benthic macroinvertebrates have been sampled three times in Big Creek. Excellent bioclassifications have been assigned in all three years, although an increasing amount of sedimentation has been observed since the stream was first sampled in 1987.

A study of the Chattooga River watershed, published by the US Environmental Protection Agency (EPA) Region IV in early 1999, suggests that five streams in this subbasin are impacted (potentially impaired) because of sedimentation. Subsequently, DWQ conducted a special study of these streams (Big, Clear, Fowler, Norton Mill and Scotsman Creeks) in June and July 1999. All streams received Excellent bioclassifications, although Clear Creek and Norton Mill Creek received lower habitat scores and were "borderline" Excellent/Good (NCDENR-DWQ, November 3, 1999).

Headwater streams in portions of the Savannah and Little Tennessee River basins, including Fowler Creek, Upper Chattooga River, Norton Mill Creek and Panthertown Creek, appear to be naturally sandy, making it difficult to separate the effects of local geology from the effects of

pollution. Streams within this geologic region, called Whiteside Granite, frequently contain a large proportion of sand and gravel substrate, yet also contain very diverse benthic macroinvertebrate communities, including a high percentage species indicative of good water quality (NCDENR-DWQ, November 19, 2001).

DWQ also sampled Abes Creek in 1999, to evaluate the potential impact from The Mountain's discharge toxicity test failures (see page 59). This stream is too small for biologists to assign a bioclassification, but insects typical of a small, clean, mountain stream were collected.

For more detailed information on sampling and assessment of streams and lakes in this subbasin, refer to the *Basinwide Assessment Report – Savannah River Basin* (NCDENR-DWQ, March 2000), available from DWQ Environmental Sciences Branch at http://www.esb.enr.state.nc.us/bar.html or by calling (919) 733-9960.

Table B-2 Use Support Ratings Summary (2000) for Monitored and Evaluated Waters in Savannah River Subbasin 03-13-01

Use Support Category	FS	PS	NS	NR	Total[1]
Aquatic Life/ Secondary Recreation	69.5 mi 0.0 ac	0.0 mi 0.0 ac	0.0 mi 0.0 ac	7.1 mi 21 ac	76.6 mi 21 ac
Fish Consumption	76.6 mi 21 ac	0.0 mi 0.0 ac	0.0 mi 0.0 ac	0.0 mi 0.0 ac	76.6 mi 21 ac
Primary Recreation	0.0 mi 0.0 ac	0.0 mi 0.0 ac	0.0 mi 0.0 ac	13.2 mi 21 ac	13.2 mi 21 ac

[1] Total miles/acres assigned to each use support category in this subbasin. Column is not additive because some waters are assigned to more than one category.

1.2 Status and Recommendations for Previously Impaired Waters

This section reviews use support and recommendations detailed in the 1997 basinwide plan, reports status of progress, gives recommendations for the next five-year cycle, and outlines current projects aimed at improving water quality for each water. The 1997 Savannah River Basinwide Plan identified one impaired water in this subbasin: Norton Mill Creek. This stream is no longer considered impaired and is discussed in further detail below.

1.2.1 Norton Mill Creek (4.5 miles from source to the Chattooga River)

1997 Recommendations

This stream was rated as impaired during the last basin cycle by using fish community data from SR 1107 that resulted in a Fair bioclassification. The recommendation was to evaluate the sources of sedimentation and/or excess nutrients in the watershed.

Status of Progress

No fish community basinwide monitoring was conducted during the most recent basin cycle because of recent revisions and a reexamination of the criteria and metrics. Historical fish

community bioclassifications have been revised to reflect better knowledge of fish communities in coldwater mountain streams.

Currently, benthic macroinvertebrate data are used to provide bioclassifications for high elevation trout streams. These data, while not a direct measure of the fish community, are a robust measure of stream integrity. Loss of canopy, increase in stream temperature, increased nutrients, toxicity and increased sedimentation will affect both the benthic macroinvertebrate and fish communities. For these reasons, benthic macroinvertebrate bioclassifications provide a valuable assessment of biological integrity (Appendix III).

In 1999, benthic macroinvertebrates in Norton Mill Creek were sampled at one site about halfway down the length of the stream (at SR 1107). This site is located well below Camelot Lake. The site received an Excellent benthic macroinvertebrate bioclassification, and the stream at this location is currently rated fully supporting. During the public comment period, citizens questioned the use of this site to rate waters above the lake and provided DWQ with a report prepared by Fish and Wildlife Associates, Inc. entitled *Westside Cove Biological and Water Quality Monitoring Program*.

Samples were collected by Fish and Wildlife Associates during September and October 2000 from both Camelot Lake and Norton Mill Creek above the lake and analyzed for nutrients, pH, conductivity, temperature and dissolved oxygen. Benthic macroinvertebrates, fish population and sediment samples were also collected and a wetland delineation was done (Boaze, 2001).

In light of these concerns, the upper portion of Norton Mill Creek from its source to an unnamed tributary below Camelot Lake is currently Not Rated. DWQ will attempt to sample this portion of stream during the next basinwide planning cycle (likely in the summer of 2004). DWQ's ORW management strategy for the Chattooga River applies to the entire Norton Mill Creek watershed (refer to page 60). Recommendations for reducing sedimentation (and the corresponding nutrient load) are discussed on page 46.

1.3 Status and Recommendations for Newly Impaired Waters

No additional stream segments in this subbasin were rated as impaired based on recent DWQ monitoring (1994-1999). Part 1.5 below discusses specific streams where water quality impacts have been observed.

1.4 303(d) Listed Waters

Norton Mill Creek (discussed above) is the only water listed on the state's year 2000 303(d) list. Refer to Appendix IV for more information on the state's 303(d) list and listing requirements.

1.5 Other Water Quality Concerns and Recommendations

Based on DWQ's most recent use support assessment, the surface waters discussed in this section are not impaired. However, notable water quality impacts were documented during this process. While these waters are not considered impaired, attention and resources should be

focused on them over the next basinwide planning cycle to prevent additional degradation or facilitate water quality improvement. A discussion of how impairment is determined can be found on page 35.

Although no action is required for these streams, voluntary implementation of BMPs is encouraged and continued monitoring is recommended. DWQ will notify local agencies and others of water quality concerns discussed below and work with them to conduct further monitoring and to locate sources of water quality protection funding. Additionally, education on local water quality issues is always a useful tool to prevent water quality problems and to promote restoration efforts. Nonpoint source agency contacts are listed in Appendix VI.

1.5.1 Chattooga River Headwaters

Although the Chattooga River has historically received Excellent bioclassifications at the basinwide sampling location relatively close to the NC/GA/SC state line, the level of sediment observed in the stream at this location has been increasing. The Cashiers community and US Highway 64 occupy much of the land in the Chattooga River headwaters. Residential and commercial resort development continues to increase steadily in this area, and concerns were expressed by participants at DWQ's Savannah River Basinwide Water Quality Workshop in October 2000 about the substantial increase in impervious surfaces in and around Cashiers.

Concerns were also expressed about the Cashiers WWTP (owned/operated by Tuckaseigee Water and Sewer Authority - TWSA). This facility is currently nearing its operational capacity (100,000 gallons/day) during the summer months when many of the resorts are full, and there are plans to build additional capacity at the present location. TWSA currently holds a NPDES permit to discharge 200,000 gallons/day into the Chattooga River below Cashiers Lake; therefore, this physical/operational expansion is not a permit expansion. This permit was issued in 1986 before the Chattooga River was classified ORW in 1989.

At the current discharge flow level (100,000 gallons/day), the Cashiers WWTP must comply with permit limits of a monthly average of 30 mg/l of BOD. Fairly simplistic treatment, called *secondary* wastewater treatment, is required to meet these limits. However, the Cashiers WWTP currently uses a more advanced wastewater treatment process called *tertiary* treatment. The tertiary wastewater treatment plant includes extended aeration for BOD reduction and nitrification for ammonia reduction (or conversion of ammonia to nitrates/nitrates). The plant also has tertiary filters for further reduction of solids and BOD. Chlorination for disinfection, as well as dechlorination for removal of residual chlorine, are also employed at the plant.

With an increase in flow to the permitted capacity (200,000 gallons/day), the facility will be required to meet limits of a monthly average of 15 mg/l of BOD and 2.2 mg/l of ammonia during the summer (4.8 mg/l in winter). With the low level of ammonia-nitrogen required by the NPDES permit, advanced wastewater treatment would be critical to meet these requirements and it is already in place for the expanded facility. Additionally, greater clarification (to aid in solids removal) is proposed with the new plant. Greater solids settling and removal may also aid in additional BOD removal.

Although the Cashiers WWTP failed four toxicity tests between 1993 and 1996, the facility was in compliance with both discharge and toxicity permit requirements over the review period used to determine use support ratings (1998-1999). The most recent inspection of the facility in June 2001 also revealed compliance with permit requirements.
In November 2001, DWQ biologists within the Environmental Sciences Branch (ESB) conducted a special study of the benthic macroinvertebrate community at two sites on the upper Chattooga River: 50 meters above the Cashiers WWTP discharge and 50 meters below the discharge. An unnamed tributary to Shortoff Creek was selected from the ESB database as a comparable stream in Jackson County. Results indicate that the Chattooga River above the Cashiers WWTP discharge is Not Impaired. However, the benthic macroinvertebrate community in the Chattooga River below the Cashiers WWTP is being significantly impacted. None of the dominant insects indicated low dissolved oxygen or an increase in organic loading. It is more likely that there is some instream toxicity (NCDENR-DWQ, November 2001). Because the stream is too small to meet the criteria for assigning a benthic macroinvertebrate bioclassification, this portion of the Chattooga River is Not Rated (refer to Appendix III for details about "small stream" use support ratings). Section A, Part 3.3 (page 31) discusses the use of benthic macroinvertebrate data to assess the biological condition of streams.

Instream fecal coliform data, collected by TWSA upstream and downstream of the Cashiers WWTP plant, indicate elevated levels of fecal coliform above the wastewater treatment plant discharge. DWQ does not have an ambient monitoring station for physical/chemical data, including fecal coliform on the Chattooga River. The entire length of the river in North Carolina is classified for primary recreation in addition to aquatic life and secondary recreation (Class B). However, until recently, DWQ had no reason to suspect that these uses were not being met.

Fecal coliform bacteria are widely used as an indicator of the potential presence of pathogens typically associated with the intestinal tract of warm-blooded animals. The water quality standard for fecal coliform bacteria is based on a geometric mean of 200 colonies/100ml. DWQ did not collect enough data during this basinwide planning cycle to appropriately assess the primary recreation use for the Chattooga River. Therefore, the stream is currently Not Rated in this category.

Cashiers Lake

DWQ sampled Cashiers Lake as part of a special study for modeling purposes in 1994. The 1997 Savannah River basin plan discussed excess nutrients, high turbidity and indicators of moderate algal productivity. Recommendations were for a citizen monitoring program (including turbidity, temperature, dissolved oxygen, fecal coliform and nutrient measurements) to supplement DWQ data. The plan also recommended that a nutrient budget be developed for the watershed above the lake. This budget could then be used to develop management strategies for nutrient reduction.

Because the land around this lake is privately owned (i.e., no public access), DWQ does not plan to sample it as part of the lakes monitoring program. If DWQ receives a request for lake sampling based on a specific water quality concern, access from the appropriate owners will be pursued. DWQ recommends that a citizen monitoring program be established and that a nutrient budget be developed as described in the 1997 Savannah River basin plan.

Recommendations

At this time, it is DWQ's position that the permit limitations for the current flow (0.1 MGD) of the Cashiers WWTP are still protective of the designated uses for which the Chattooga River is currently classified. DWQ also believes that the permitted flow and its corresponding permit limitations can also be achieved while protecting the designed uses of the Chattooga River at the current location. However, if TWSA does not proceed forward with the plant expansion, DWQ will still require the owner to provide additional clarification to accommodate peak loading because the current clarifiers are under-designed and overloaded during peak flow conditions (summer months).

DWQ plans to conduct (unannounced) instream and effluent toxicity testing at the Cashiers WWTP plant prior to intensive biological sampling of the Savannah River basin in 2004. DWQ also plans to resample the upper Chattooga River below the Cashiers WWTP at that time, if change in the benthic macroinvertebrate community is expected. DWQ will pay special attention to chlorine data on discharge monitoring reports for the Cashiers WWTP and occasionally sample the effluent (unannounced). DWQ has already recommended in writing to TWSA that an evaluation of chlorine use and the functionality of the dechlorination system should be performed at the plant.

As resources allow, DWQ will also monitor fecal coliform bacteria levels in the Chattooga River. There are no permitted point source discharges in the watershed above the Cashiers WWTP. Therefore, a study is needed to determine contributions of straight pipes, leaking and failing septic systems to the elevated fecal coliform levels. Runoff from developed areas, as well as primary recreation activities, also contribute bacteria to lakes and streams.

Growth management in this area within the next five years will be imperative in order to restore and maintain good water quality in the Chattooga River headwaters. Growth management can be defined as the application of strategies and practices that help achieve sustainable development in harmony with the conservation of environmental qualities and features of an area. On a local level, growth management often involves planning and development review requirements for construction that are designed to maintain or improve water quality. Growth management also includes planning for increasing water supply and wastewater treatment needs. An organized group of dedicated citizens can be an effective tool for affecting water quality improvement and protection in a watershed. For general recommendations about best management practices to control sedimentation and pollution from urban runoff, please refer to Section A, Chapter 4.

1.5.2 Abes Creek

Abes Creek is part of the Overflow Creek watershed which is classified Outstanding Resource Waters. The Highlands Camp and Conference Center (currently called The Mountain) WWTP is one of two dischargers in the watershed permitted before the ORW designation and management strategy were applied. Chronic toxicity problems at this facility were discussed in the 1997 basin plan. The Mountain has experienced problems meeting its toxicity permit limits since monitoring began in 1993. In seven years (1993-1999), only 31 percent of tests met permitted limits for toxicity. Enforcement action was taken by DWQ during the previous basinwide cycle

(1991-1995), and it seemed the facility had resolved the toxicity problems by changing detergents that were used in dishwashing and laundry activities.

In 1999, The Mountain began to again experience problems meeting toxicity limits. Current problems are attributed to low pH in the retreat center's well water supply. The facility installed a new well; however, pH levels are still as low as 3.2. DWQ assessed the facility a fine of $2,000 in 1999, and an Asheville Regional Office inspector is continuing to provide technical assistance. It is common in the mountain region for facilities to have to perform pH control measures for their water supplies in order to alleviate problems with wastewater treatment. It is recommended that The Mountain pursue ways to raise the pH of its drinking water.

Fortunately, it appears that these toxicity problems have not yet adversely impacted Abes Creek. DWQ collected a benthic macroinvertebrate sample from the stream in June 1999. Although the stream is too small for biologists to assign a bioclassification, insects typical of a small, clean, mountain stream were collected.

1.6 Additional Issues within this Subbasin

The previous part discussed water quality concerns for specific stream segments. This section discusses water quality issues related to multiple watersheds within subbasin 03-13-01. Habitat degradation in smaller streams that DWQ does not monitor was a concern expressed by participants of the public workshop and forum held in the Savannah River basin.

1.6.1 Habitat Degradation in Smaller Streams

Although no water quality data have been collected by DWQ for smaller streams draining the south side of Highlands, increased development in this area presents the potential for habitat degradation in the headwaters of Big Creek, Clear Creek and East Fork Overflow Creek. DWQ biologists noted that although the sampling location on Big Creek is located in a forested area, substantial development exists in the upper sections of the watershed, including both residential and agricultural land uses. These activities have contributed to increasing sedimentation at the sampling location; therefore, smaller tributaries could be more heavily impacted. Higher amounts of habitat degradation were also noted for Clear Creek at the 1999 special study location near the confluence of Brooks Creek. For general recommendations on habitat degradation and best management practices, please refer to page 46.

1.6.2 Outstanding Resource Waters

With the exception of the Tullulah River and Clear Creek watersheds, an Outstanding Resource Water (ORW) management strategy applies to all waters within this subbasin. Figure B-2 presents the area and Table B-3 lists the waters to which an ORW management strategy applies. Table B-3 also distinguishes between those waters classified ORW and those to which the modified management strategy applies.

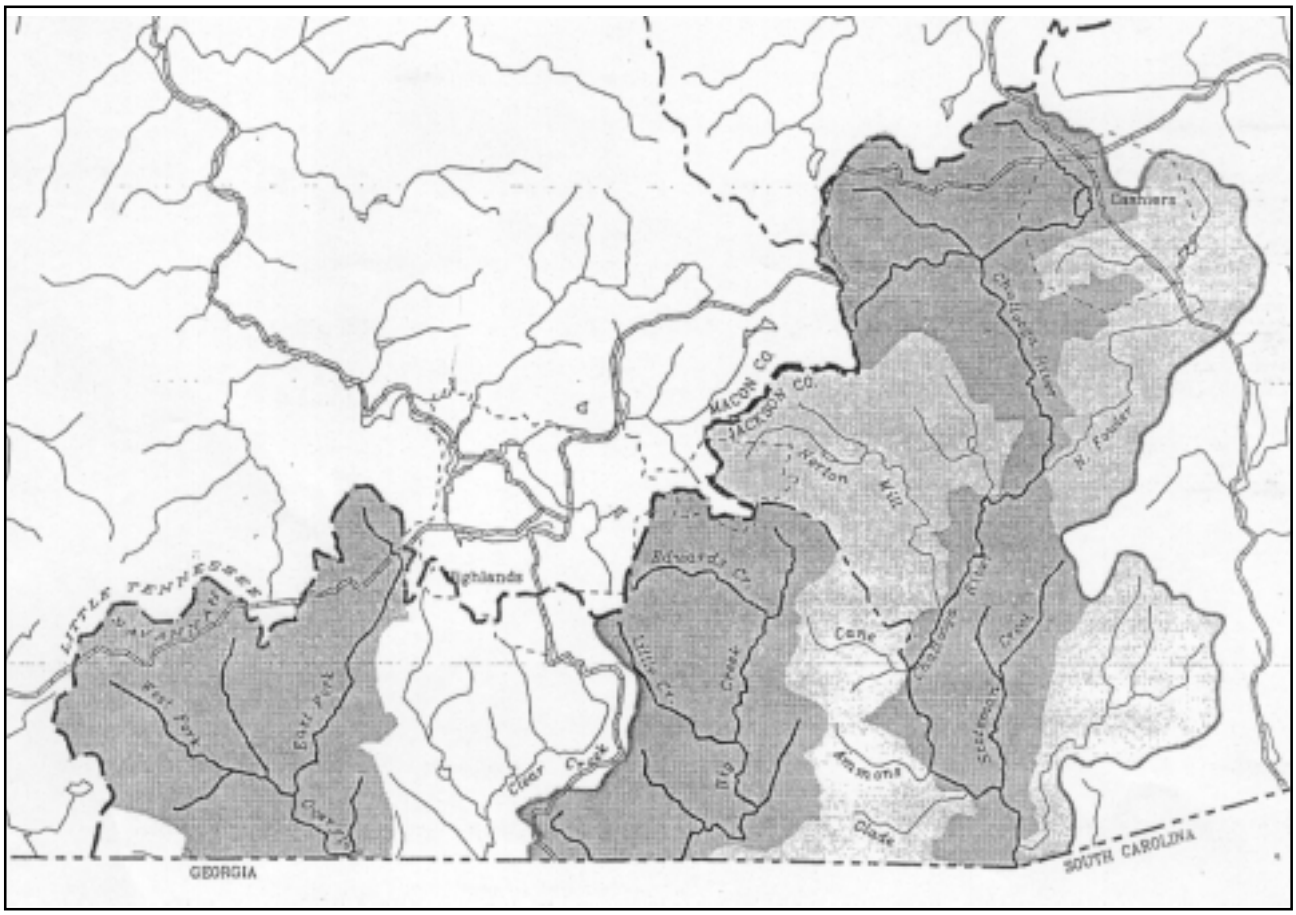

Figure B-2 Chattooga River ORW Area

Table B-3 Waters to which an ORW Management Strategy Applies

Watershed	Management Strategy Status
Chattooga River mainstem & two headwater tributaries	Classified ORW
Scotsman Creek and its tributaries	Classified ORW
Big Creek and its tributaries incl. Edwards & Little Creeks	Classified ORW
East & West Fork Overflow Creeks and tributaries	Classified ORW
North & South Fowler Creeks and tributaries	Modified management strategy applies
Green & Norton Mill Creeks and tributaries	Modified management strategy applies
Cane Creek and its tributaries	Modified management strategy applies
Ammons Branch and Glade Creek	Modified management strategy applies

Special protection measures that apply to waters classified ORW are set forth in 15A NCAC 02B .0225. No new discharges or expansions are permitted and a 30-foot buffer or stormwater controls are required for most new development. Specifically, development activities requiring a Sediment/Erosion Control Plan will be regulated as follows:

Low Density Option: Developments which limit single family developments to one acre lots and other types of developments to 12 percent built-upon area, have no stormwater collection system as defined in 2H .1002(13), and have built-upon areas at least 30 feet from surface waters will be deemed to be in compliance.

High Density Option: Higher density developments will be allowed if stormwater control systems utilizing wet detention ponds as described in 2H .1003(i), (k) and (l) are installed, operated and maintained, so that the runoff from all built-upon areas generated from one inch of rainfall is controlled. The size of the control system must take into account the runoff from any pervious surfaces draining to the system.

The Asheville Regional Office of the Division of Land Resources (DLR), Land Quality Section has maps showing this and ORW areas throughout the region. When a construction project on land that is larger than one acre is proposed in an ORW watershed, DWQ is notified by DLR and these more stringent development standards are required as part of the sediment/erosion control plan approval process. Additionally, when DWQ receives a request for a permit for a discharge from a new subdivision, construction of a new sewer line, or for a 401 certification, DWQ determines the stream classification and notifies the local government and the applicant of these requirements. DWQ is also working through the Councils of Government (COGs) to further educate local governments about the requirements of ORW and HQW as well as to inform them about what waters carry these protective classifications.

The only difference between the strategies presented in Table B-3 is that existing discharges on waters not classified ORW will be allowed to expand, provided there is no increase in pollutant loading. The prohibition of new discharges and the development restrictions outlined above apply equally to those waters classified ORW and those with a modified management strategy. There are only three existing discharges within the modified management strategy area: Cullasaja Homeowner's Association, Mark Laurel Homeowner's Association and The Mountain.